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(71) Applicant(s)
Rover Group Limited
(Incorporated in the United Kingdom)
International Headquarters,
Warwick Technology Park, WARWICK, CV34 6RG,
United Kingdom

(72) Inventor(s)
Kevin Trevor Talbot

(74) Agent and/or Address for Service
Alan S Wilson
Rover Group Limited, Gaydon Test Centre, Banbury Road, Lighthorne, Warwick, CV35 0RG,
United Kingdom

(54) Abstract Title
A security system able to disable a vehicle when in a safe zone

(57) A security controller 112 for a vehicle 10 communicates with its navigation system 110 which receives co-ordinates from a satellite 20 and compares them with maps stored in its memory 113. Zones are defined in which the vehicle 10 is authorised to travel. If the vehicle has left its 5 permitted zones, the security controller 112 determines if the vehicle 10 is in a safe state to be immobilised and, if it is in such a state, the vehicle 10 is immobilised. If the vehicle is not in a safe state, the security controller 112 monitors the vehicle 10 and immobilises it when it is next in an area defined as a safe zone in said map. Immobilisation causes the 10 engine management system 116 to cut out the ignition system 117 and the siren 114 and hazard lights 115 are activated. The security controller 112 with a remote station 30. The system is also activated by conventional theft detection devices.

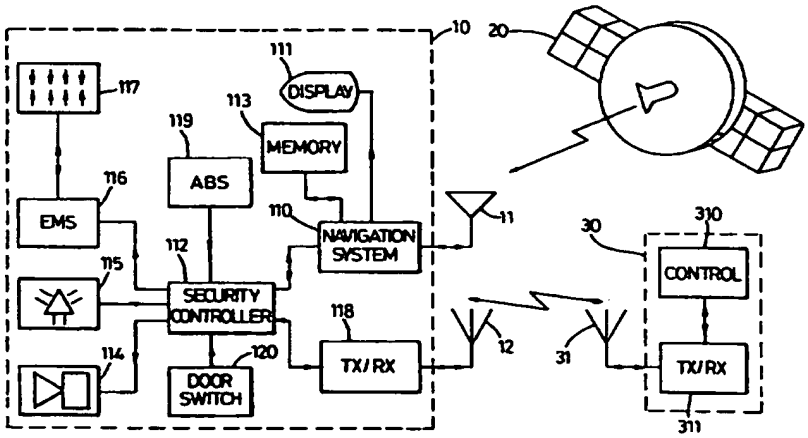

Fig. 1

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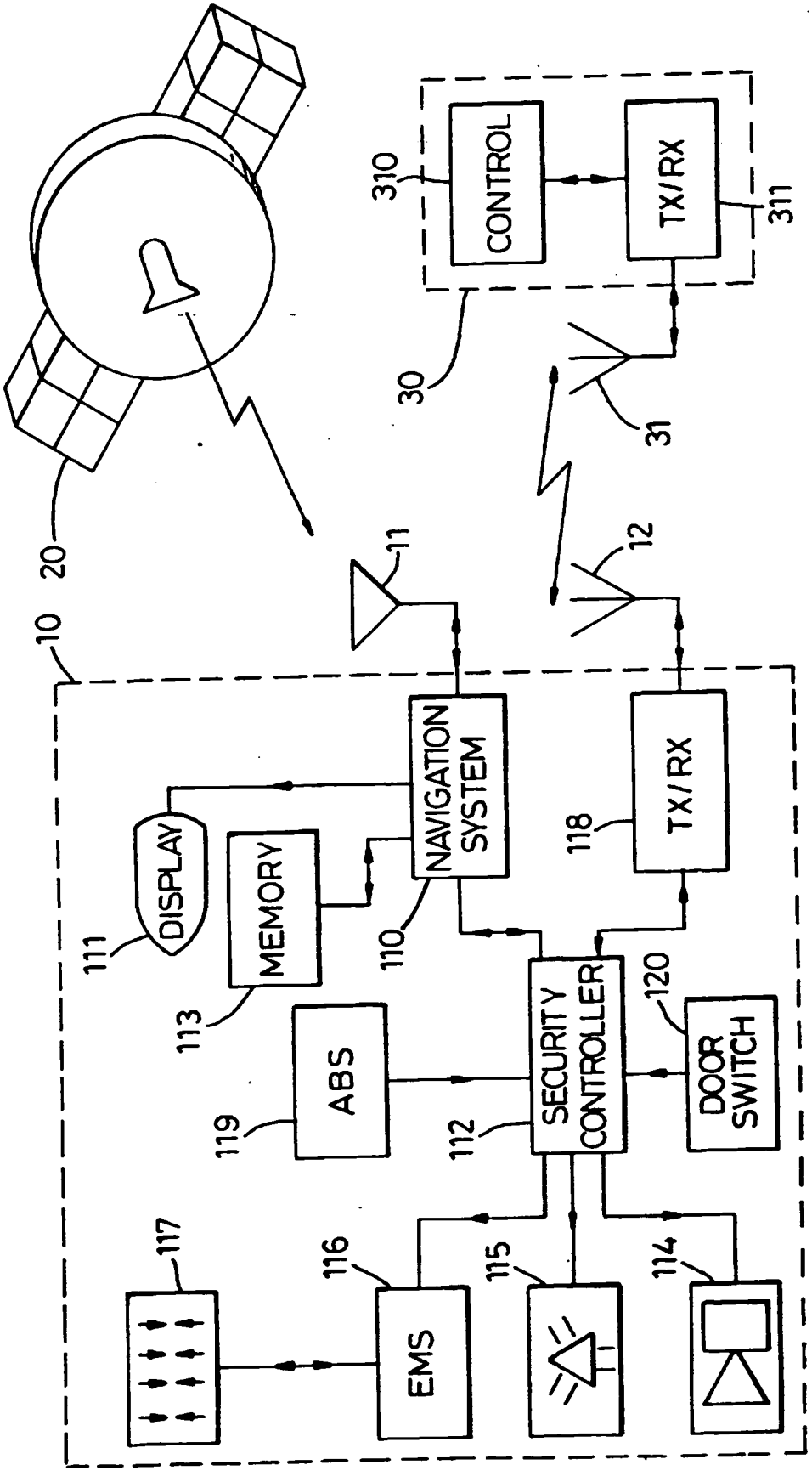
20
10
11
12
30
31
310
CONTROL
TX/RX
311
NAVIGATION SYSTEM
DISPLAY
MEMORY
111
113
110
118
TX/RX
ABS
119
SECURITY CONTROLLER
112
120
DOOR SWITCH
117
116
EMS
115
114

Fig. 1

A Vehicle Security System

This invention relates to motor vehicle security systems and in particular to vehicle security systems which are in communication with a navigation system.

This application is a divisional application based on GB 9518770.4, which claims a security system arranged to authorise travel in certain zones of a memorised geographical map.

It is known to provide a vehicle with a system so that it can determine its position. One version of such a system is a navigation system which determines its position by communicating with a geopositional satellite, such as the "Navistar Global Positioning System", and obtains co-ordinates therefrom. Another version determines the vehicle position by monitoring transmissions from transponders on or near the roadside, which may be mounted for example within lampposts, on overhead gantries or at toll booths. In both these cases, a receiver is mounted in the vehicle. The systems described above use the co-ordinates received to present information to the driver such as navigational information or details about the collection of tolls.

It is also known from EP 0 242 099 to provide a vehicle with a security system which monitors the vehicle position by communicating with a navigation system and passing this information to a remote security control office. The remote security control office can interrogate the security system to determine its position and can instruct it to disable the vehicle if it determines that the vehicle has been taken without authorisation, e.g. by illegal entry.

Such a prior art system may not necessarily determine that the vehicle has been taken illegally. If, for example, the keys are taken, the vehicle is hijacked or the owner is kidnapped with the vehicle, there will be no reason for the remote security control office to suppose that the vehicle has been taken illegally.

It is known in the United Kingdom to provide a scheme for identifying a vehicle which should not be driving at night. In this scheme, known locally as "Vehicle Watch", vehicle owners who do not use their vehicles at night register this fact at the local police station, thereby authorising the police to stop said vehicles if they are seen travelling at night. On registering for "Vehicle Watch", each vehicle is fitted with one or more distinctive markers to make it readily identifiable, such as large bright green stickers on the front and rear windscreens. The scheme relies on the marker being seen and the fact reported.

It is an object of the present invention to provide an improved security system.

According to the invention a vehicle security system is provided comprising a security controller means and a positional condition determining means, the positional condition determining means including a memory having a map of a region stored in it and being arranged in use to monitor the position of the vehicle within said region, the security controller means being arranged in use: to determine when vehicle disabling is required; to check whether the vehicle is in a safe state to be disabled; if the vehicle is in a safe state, to disable the vehicle; or, if the vehicle is not in a safe state, to monitor the state of the vehicle until it is in a safe state and then to disable the vehicle, wherein the positional condition determining

means is arranged in use to define a zone in said map as a safe zone in which said vehicle is in a said safe state for being disabled. The positional condition determining means may be arranged to determine, for example, whether the vehicle has entered or left a predetermined area, whether it has crossed a border, whether it is within a predetermined distance of a particular point, whether it is on a particular route or which side of the road it is on.

Said safe zone may be at least in part further defined by the condition of the vehicle. Said condition may be at least in part defined by vehicle speed and/or by the transverse position of the vehicle on the road upon which it is travelling.

Said safe zone may be at least in part defined according to the time or date.

It may be possible to alter or change the definition of said safe zone and a vehicle user may be able to authorise alterations or changes to the definition of said safe zone.

The security system may further comprise a vehicle transmitter means mounted on the vehicle, which transmitter means may be arranged to send signals in response to a signal from the positional condition determining means. The vehicle transmitter means may be arranged to transmit signals when the vehicle has been moved without authorisation and possibly also when the vehicle has been moved without authorisation and the security controller means determines that the vehicle is in a predetermined positional condition.

The security system may further comprise a remote station which is arranged to receive signals from the vehicle transmitter, which may include a remote controller which is arranged to track the vehicle.

The invention will now be described by way of example only, with reference to the accompanying drawing in which:

Figure 1 is a schematic representation of a system in accordance with the present invention.

With reference to Figure 1 a security system is provided for a vehicle 10 which comprises a positional condition determining means in the form of a navigation system 110 mounted on the vehicle 10 arranged to receive signals through a satellite receiver 11 also mounted on the vehicle 10 from a geopositional satellite (GPS) 20 orbiting the earth. The positional condition determining means further comprises a display 111 and a memory 113 which are in communication with the navigation system 110. The security system further comprises a security controller 112 also mounted on the vehicle 10 which is arranged to receive signals from the navigation system 110. Means are provided to indicate a condition in which it is safe to immobilise the vehicle 10 and in this example these are in the form of signals provided by an anti-lock braking system (ABS) 119 which are inputted to the security controller 112. The security system further comprises immobilisation means which comprises an engine management system 116 arranged to disable the engine ignition 117 and also includes warning means comprising a siren 114 and hazard lights 115. The security system further comprises communication means in the form of a transceiver 118 and antenna 12 mounted on the vehicle and a remote station 30 comprising an antenna 31, a transceiver 311 and a remote security control

310. Means are provided to detect illegal entry in the form of a door switch 120.

The navigation system 110 has a memory 113 in which are stored maps programmed under the authorisation of the vehicle user. These maps are loaded into the memory 113 at an approved agent and are encrypted so that they cannot be altered without the navigation system 110 being connected to a mapping system (not shown) which has the necessary decryption key. These maps define the areas the vehicle 10 is permitted to enter and are stored in the form of GPS 20 co-ordinates. The maps may be defined from known road maps such as squares from a "Geographer's A-Z". Separate permitted areas are connected by authorising "corridors" between them, such as a section of motorway.

The navigation system 110 is active all the time and periodically requests its position from the GPS 20, which may be every 2 minutes. The navigation system 110 receives co-ordinates from one or more GPS 20. The co-ordinates are decoded and navigational information is presented to the driver on a display 111 in the conventional manner known in the art for such systems and not discussed further herein.

The navigation system 110 compares the "Navistar" co-ordinates received from each interrogation of the GPS 20 with the co-ordinates representing permitted zones stored in the memory 113. If the current positional condition of the vehicle 10 is defined by the navigation system 110 as unauthorised, as a result of the comparison of co-ordinates carried out above, the navigation system 110 sends a signal to the security controller 112 indicative of a change from an authorised positional

condition. The signal from the navigation system 110 to the security controller 112 also includes the current location of the vehicle 10.

On receipt of a signal from the navigation system 110 indicative of an unauthorised positional condition, the security controller 112 will initiate disablement of the vehicle 10. To prevent safety risks, the disablement will be in a controlled manner and will only occur when the vehicle 10 is in a predetermined safe state. One safe state could be defined as when the wheel speed is zero and a signal of such a condition could be obtained by arranging the security controller 112 to monitor a wheel speed signal from an anti-lock braking system (ABS) 119. To disable the vehicle 10, the security controller 112 sends a signal to the EMS 116 which cuts out the ignition system 117. As part of the same immobilisation procedure, the security controller 112 sounds the siren 114 and turns on the hazard lights 115.

If the security controller 112 determines that the vehicle 10 is not in a safe state for immobilisation, e.g. the wheel speed signal from the ABS 119 is not zero, it will monitor that condition until it is in a safe condition and then immobilise the vehicle 10.

Conventional theft detection means are incorporated into the security system and the same disablement procedure is initiated by a signal from these means. One such method of detecting illegal entry or tampering is the inclusion of a door switch 120 detecting a door (not shown) being opened without the use of the correct key (not shown). The security controller 112 constantly monitors the state of this door switch 120.

A further feature of the security system is a means of communicating with one or more remote stations 30 (one shown). A transceiver 118 and antenna 12 are provided on the vehicle 10 and are arranged to send and receive signals under the control of the security controller 112. Such a communication system may comprise a conventional cellular mobile telephone (not shown). Each remote station 30 comprises an antenna 31, transceiver 311 and remote security controller 310. The security controller 112 sends signals indicative of its positional condition and state as defined by the navigation system 110 and the security controller 112. These signals are received by the remote station 30 and relayed to the police. Upon authorisation from the police, the remote station 30 will send instructions to the security controller 112, which the security controller 112 is arranged to carry out. This feature provides a method of remotely controlling the vehicle 10 in the event that it has been found to be moved without authorisation but has not yet left a permitted zone and is not yet in a safe state for immobilisation. It provides the option of initiating an "emergency disable" from a remote controller 310 when, for example the vehicle 10 is being pursued by the police. One method of implementing an "emergency disable" would be to instruct the security controller 112 to control the engine management system 116 to disable the ignition system 117 one cylinder at a time, thereby producing a controlled reduction in power output until the ABS 119 indicates that wheel speed is zero and normal disablement can take place.

In the event of an authorised route becoming unusable, such as through an accident blocking the road, the navigation system 110 is arranged to select a suitable diversion from the maps held in its memory 113. The navigation system 110 will communicate with the security system 112

which will temporarily authorise the diversion, even if it means leaving all currently authorised zones. The navigation system 110 will display the diversion to the driver on its display 113. The normal functions for unauthorised taking will be applied if the vehicle 10 leaves the authorised route of the diversion.

Within the scope of the disclosure provided herein, it would be possible to further provide means of instigating an electronic "Vehicle Watch". The authorisation to travel in each or any zone or on specific routes could be made dependent on the time of day. The security controller 112 would include a clock (not shown) for timing the authorisation of zones and routes. In this way an owner could authorise the vehicle 10 to be driven, for example, to and from the local hospital and nowhere else between, for example, 20:00 and 07:00 hours. Any other use between those times would cause the security controller 112 to implement automatic vehicle tracking and carry out the other actions described above for vehicle taking without authorisation.

The inclusion of a mobile telephone (not shown) in the system provides the owner with the option of arranging further authorised zones or changing the authorised times of use without leaving the vehicle 10. Such an arrangement could include a secret password or personal identification number (PIN). This option may be exercised by a vehicle user giving authorisation in conjunction with a password over a mobile telephone connection to a remote station 30, which remote station 30 could be arranged to transmit new co-ordinates for authorised zones to the vehicle security controller 112 through the vehicle transceiver 118. Those new co-ordinates could then be passed to the vehicle navigation system 110 which could alter its memory 113 accordingly. Protection from hijack could be

afforded by instigating tracking while the vehicle 10 was out of its normally authorised zones. This feature prevents the system from stranding a motorist, for example, who needs to make a change to authorised zones at short notice such as when on holiday.

It will be apparent to the man skilled in the art that the security system disclosed herein will initiate vehicle disablement on leaving its predefined permitted operating zones, whether or not vehicle taking has occurred or been reported. This provides protection for the owner in the event of kidnapping, hi-jacking or theft of the vehicle keys. This aspect of the system is self contained and protected from bypassing. It also operates automatically during other forms of theft. The system further provides for vehicle tracking to be initiated on leaving the permitted zones.

The determination of a state in which it is safe to disable the vehicle 10 is not limited to a signal from the ABS 119. The navigation system 110 could be arranged to provide signals indicative of such a safe zone and might include in that definition a consideration of the position of the vehicle 10 in the road. In this manner the security controller 112 could avoid, for example, disabling a vehicle on the wrong side of the road, e.g. overtaking, but doing it immediately the vehicle 10 enters a lay-by or a side street.

The positional condition determining means are not limited to being a navigation system 110 based around a GPS 20 but may take the form of roadside transceivers.

Disablement of the vehicle 10 is not limited to cutting out the ignition 117 and may take the form, for example, of disabling successive fuel injectors or progressively reducing the engine revolution limit.

CLAIMS

1. A vehicle security system comprising a security controller means and a positional condition determining means, the positional condition determining means including a memory having a map of a region stored in it and being arranged in use to monitor the position of the vehicle within said region, the security controller means being arranged in use: to determine when vehicle disabling is required; to check whether the vehicle is in a safe state to be disabled; if the vehicle is in a safe state, to disable the vehicle; or, if the vehicle is not in a safe state, to monitor the state of the vehicle until it is in a safe state and then to disable the vehicle, wherein the positional condition determining means is arranged in use to define a zone in said map as a safe zone in which said vehicle is in a said safe state for being disabled.

2. A vehicle security system according to Claim 1, wherein said safe zone is at least in part further defined by the condition of the vehicle.

3. A vehicle security system according to Claim 2, wherein said condition is at least in part defined by vehicle speed.

4. A vehicle security system according to Claim 2 or Claim 3, wherein said condition is at least in part defined by the transverse position of the vehicle on the road upon which it is travelling.

5. A vehicle security system according to any preceding claim, wherein said safe zone is at least in part defined according to the time or date.

6. A vehicle security system according to any preceding claim, wherein the definition of said safe zone can be altered or changed.

7. A vehicle security system according to Claim 6, wherein a vehicle user can authorise alterations or changes to the definition of said safe zone.

8. A vehicle security system according to any preceding claim, further comprising a vehicle transmitter means mounted on the vehicle.

9. A vehicle security system according to Claim 8, wherein the vehicle transmitter means is arranged to send signals in response to a signal from the positional condition determining means.

10. A vehicle security system according to Claim 8 or Claim 9, wherein the vehicle transmitter means is arranged to transmit signals when the vehicle has been moved without authorisation.

11. A vehicle security system according to Claim 10, wherein the vehicle transmitter means is arranged to transmit signals when the vehicle has been moved without authorisation and the security controller means determines that the vehicle is in a predetermined positional condition.

12. A vehicle security system according to any one of Claims 8 to 11, further comprising a remote station which is arranged to receive signals from the vehicle transmitter.

13. A vehicle security system according to Claim 12, wherein the remote station includes a remote controller which is arranged to track the vehicle.

The Patent Office

INVESTOR IN PEOPLE

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Application No: GB 9912359.8
Claims searched: 1 to 13

Examiner: Mark Bell
Date of search: 29 June 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): F1B (2Z), G4N (NHVX)

Int Cl (Ed.6): B60R 25/00, 25/04, 25/10

Other: ONLINE: WPI, PAJ, EDOC

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	EP0736425 (KLASHKA)	1, 9 to 13

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.